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The caddisfly (Insecta, Trichoptera) of Ko Hong Hill nature preserve, southern Thailand¹

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A b s t r a c t : The adult caddisfly fauna of Ko Hong Hill nature preserve area in southern Thailand was sampled monthly using portable black light traps from June 2006 to June 2007. All specimens were identified to species level. A total of 567 male individuals, belonging to 36 species, 20 genera and 10 families were recorded from the current study. Of the 36 species collected, *Chrysotrichia pallu*, *Adicella elon*, and *Oecetis husam* were new to science, and *Hydromanicus malayanus* was a new record for Thailand. Five species, *Ecnomus venimar*, *Hydromanicus malayanus*, *Anisocentropus diana*, *A. brevipennis*, and *Rhyacophila tantichodoki* were found year-long and the most common species in the research area. Thus, the current study represents an important contribution to the knowledge of the caddisfly fauna of Thailand.

K e y w o r d s : Trichoptera, Ko Hong Hill, nature preserve, Thailand.

Introduction

Thailand has a rich flora and fauna, but the knowledge of these organisms is poorly known, especially the biodiversity of aquatic insects. Studies of biodiversity in Thailand have been launched in the last decade and focused on only a few groups of aquatic insects. Caddisflies (Trichoptera) is one of the best known aquatic insect groups in Thailand (mainly from the northern area). More than 1000 species have now been identified based on adult male genitalia (MALICKY 2002, 2005a, 2005b, 2006, MALICKY & CHANTARAMONGKOL 1999, 2000, 2003, MALICKY & PROMMI 2006, MALICKY et al. 2000a, 2000b, 2001, 2002, 2004, 2005, 2006). However, the diversity of Trichoptera in Thailand is still in the infant stage; numerous new species likely remain to be discovered and described, especially in the southern part of Thailand. Specimens of caddisfly species in southern Thailand have been selected on occasional or incidental collections. Many species may be endemic to the southern parts of Thailand (MALICKY & CHANTARAMONGKOL 1999). Recently, the data on adult caddisflies in southern Thailand was published (MALICKY & PROMMI 2006). Of the 215 species found, 23 species of caddisflies were new to science (MALICKY & PROMMI 2006).

Ko Hong Hill is an isolated mountain, situated in Haad Yai District, Songkla Province, southern Thailand; about 5 km SE of Haad Yai, at approximately 7° north latitude, 100° 30' east longitude. The hill, which lies on an approximate N-S axis, includes an area of about 13 km² and includes two major peaks: Ko Hong Hill, 371 m; and Choom Sak Hill, 325 m. The land of the east and west of Ko Hong Hill is flat and at sea level, thus the entire mountain is surrounded by the either settled or agricultural land. There are several small streams in the

¹ This paper is dedicated to Prof. Dr. Hans Malicky on the occasion of his 75th birthday.

area, three of which had reservoirs or lake built at the base of the hill; at the Haad Yai Municipal Park and Zoo, on the Prince of Songkla University campus; and at the base of the SE slope. These three streams flow throughout the year, while other streams are intermittent with water only during rainy periods. The climate of peninsular Thailand, in fact of all the lowland areas of Thailand and the Malay Peninsula, is monsoonal in nature. Ko Hong Hill, due to disturbance, is drier and hotter than it used to be when it was covered with primary vegetation. The vegetation of Ko Hong Hill has been secondary for 30-40 years. Large areas have been planted with para rubber (*Hevea brasiliensis*), which has spread naturally in many places; however many of these estates have become over grown with secondary vegetation (MAXWELL 2006). Baseline organism biodiversity research is necessary for an understanding of ecosystem, ecology and organism conservation. The conservation aspect is becoming increasingly important due to a measured decline in worldwide organism biodiversity and a concern over the potential ecological implications of this decline. The aim of the study was to investigate the faunal composition of caddisflies inhabiting nature preserve area. Although the primary value is to add to the knowledge of the Trichoptera fauna of southern Thailand itself, this research has further value of helping to fill gaps in our knowledge of Trichoptera distribution in Thailand.

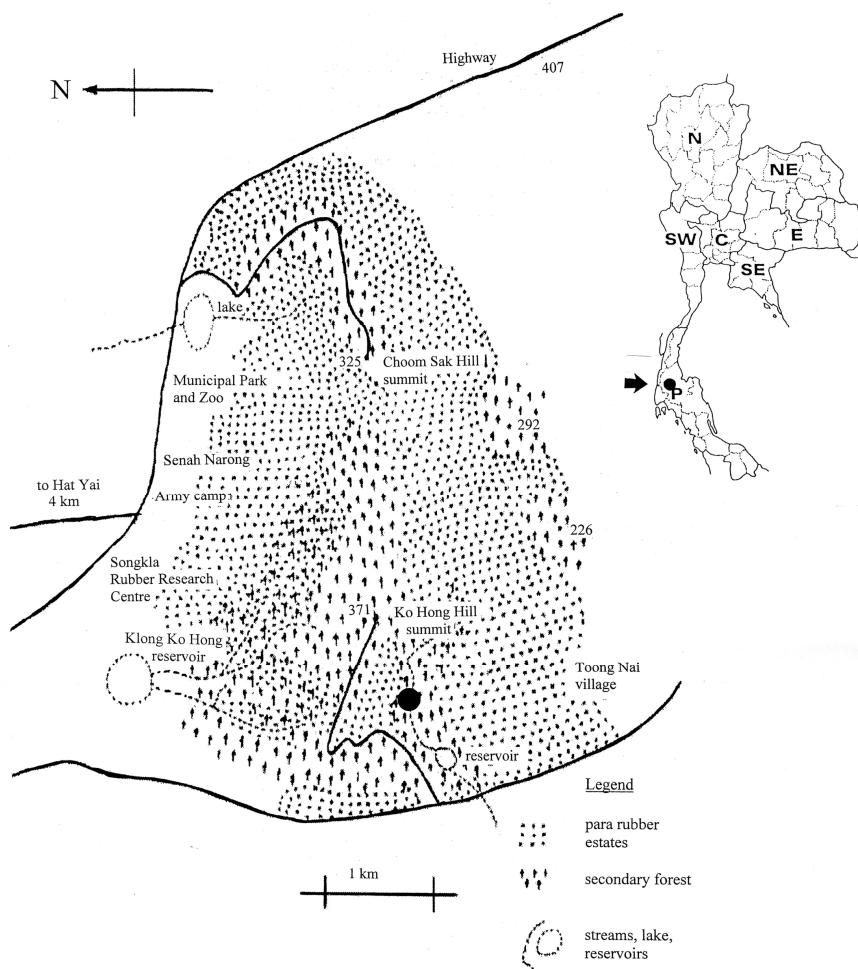


Fig. 1: Map of Thailand showing sampling site at Ko Hong Hill (●) (Source: Maxwell 2006).

Materials and methods

Adult caddisflies were attracted with 10 Watt black light traps operated from a 12-volt DC battery, suspended across white pans filled with water and a few drops of liquid detergent. The traps were operated at water's edge from shortly before dusk until the next morning for one night monthly from June 2006 to June 2007. Insects were kept into 80 % EtOH. Samples were sorted and specimens were identified by using a stereomicroscope (WILD M3B). For most caddisfly species, adult males were primarily used for species determinations. The last two abdominal segments of adult male genitalia were cut and cleared by heating in 10 % NaOH at 70 °C for 30 minutes. Literature used for identifying specimens was MALICKY (1997) as well as the following publications: MALICKY (2002, 2005a, 2005b, 2006), LAUDEE & MALICKY (1999) MALICKY & CHANTARAMONGKOL (2000, 2003, 2006) MALICKY & PROMMI (2006) MALICKY et al. (2000, 2000a, 2001, 2002, 2004, 2005, 2006).

Results

A total of 567 male individuals, belonging to 36 species, 20 genera and 10 families were recorded during the current study. Of the 36 species collected, three species were new to science (MALICKY 2008, MALICKY 2009), and another species was a new record for the caddisfly fauna of Thailand. The highest number of species was collected in January and June (18) and the lowest in August (5) (Table 1). Three families, the Leptoceridae, Hydropsychidae, and Philopotamidae were the most diverse family collected at Ko Hong Hill. The Leptoceridae were represented by 11 species constituting 6.53 % of the number of individuals collected. The two species of Ecnomidae were more abundant than the Leptoceridae and represented 28.57 %, followed by the Calamoceratidae represented 18.37 % of the caddisfly collection. Hydropsychidae were the second speciose and comprised 17.28 % of the seasonal total. Whereas, Philopotamidae, which was equal in species number to Hydropsychidae, represented 9.88 % of the seasonal total (Table 2). Many species exhibited flight periods that extended over several months. Five species, *Ecnomus venimar*, *Hydromanicus malayanus*, *Anisocentropus diana*, *A. brevipennis*, and *Rhyacophila tantichodoki* were collected continuously, or nearly so, and the latter species is endemic to the study area. Of the 36 species collected, seven species were represented by only a single specimen over the entire study. Some of these species might either be rare or not local endemic. Therefore, phenological data of species represented by relatively few specimens over the year can be misleading.

The meteorological parameters recorded at the Ko Hong Hill nature preserve area for the period of June 2006 to June 2007 are given in Table 3. Climate of the area is influenced by seasonal monsoons [i.e., southwest and northeast monsoons, that produce two seasons: dry (December-April) and wet (May-November)]. The temperature is highest in April (29.6 °C) and monthly rainfall is highest in September (301.4 mm).

Pearson's correlation test was used to determine the relationship between abundance of Trichoptera and the local climate in the area (i.e. air and water temperatures, rainfall, humidity, and wind speed). The results indicated that the occurrence of many species of Trichoptera were significantly related to the effects of local climate according to the data (Table 4).

Discussion

Taxonomic composition, richness, and abundance varied greatly among months. In general, higher richness and abundance were recorded in the dry months (December-June), and the rainy season of July-November yielded lower richness and abundance values. Abundance of Trichoptera adults was related to the seasons (CHANTARAMONGKOL et al. 1999). Microclimatic conditions experienced during the adult phase have an impact on survival and longevity. Air temperature and relative humidity are of particular importance, with higher temperatures and lower humidity reducing the adult lifespan of aquatic groups (COLLIER & SMITH 2000). Microclimate also influences the flight activity of aquatic species (WARINGER 1991, BRIERS et al. 2003). In common with terrestrial groups, the flight activity of aquatic adults appears to be affected primarily by air temperature, but humidity also influences flight in some groups. In this study, wind seems to be the main abiotic factor that affected the abundance of most species, except *Ecnomus venimar*, whereas relative humidity seems not to be a minor factor that influenced the abundance of adult Trichoptera in this study.

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Zusammenfassung

Die adulten Köcherfliegen des Ko Hong Hill Naturschutzgebietes im Süden Thailands wurden allmonatlich zwischen Juni 2006 und Juni 2007 mit Schwarzlichtfallen untersucht. Die Männchen wurden auf Artniveau bestimmt. 567 Männchen von 36 Arten, 20 Gattungen und 10 Familien wurden gefunden. Drei Arten (*Chrysotrichia pallu*, *Adicella elon* und *Oecetis husam*) waren neu für die Wissenschaft. *Hydromanicus malayanus* war ein Neufund für Thailand. Fünf Arten (*Ecnomus venimar*, *Hydromanicus malayanus*, *Anisocentropus diana*, *A. brevipennis* und *Rhyacophila tantichodoki*) wurden über das ganze Jahr hin gefunden und waren die häufigsten Arten.

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Tab. 1: List of caddisfly species collected in Ko Hong Hill nature preserve area, southern Thailand; M & C= Malicky & Chantaramongkol; *new record for the fauna of Thailand; **new to science.

Species/date	2006						2007					
	27/ 06	6/ 07	6/ 08	12/ 09	1/ 10	1/ 11	14/ 12	3/ 01	10/ 02	26/ 03	22/ 04	5/ 05
Rhyacophilidae												
<i>Rhyacophila tantichodoki</i> M & C, 1993	3	5	2	1	1	1	3	7	2	1	2	1
Hydropsytiidae												
** <i>Chrysotrichia pallu</i> MALICKY & PROMMI, 2009												1
<i>Orthotrichia asimetris</i> WELLS & MALICKY, 1997												1
Philopotamidae												
<i>Chimarra atnia</i> M & C, 1993	3	19					2		4	1	2	1
<i>Chimarra coma</i> M & C, 1993						1	1	2		1	5	2
<i>Chimarra pipake</i> M & C, 1993						1						
<i>Chimarra ravanna</i> M & C, 1993												1
<i>Chimarra skaidan</i> MALICKY, 1989												2
<i>Chimarra vibena</i> M & C, 1993												7
Polycentropodidae												
<i>Nyctiophylax pongdlatensis</i> M & C, 1993					1				2	1	8	1
<i>Polyplectropus taleban</i> M & C, 1993	2			1				1	1	4		1
<i>Polyplectropus josaphat</i> M & C, 1993												2
<i>Pseudoneureclipsis vali</i> M & C, 1993												1
Psychomyiidae												
<i>Tinodes ragu</i> M & C, 1993	4	11	2		1							
Ecnomidae												
<i>Ecnomus talenoi</i> M & C, 1993							3	3		1		
<i>Ecnomus venimar</i> M & C, 1993	18	27	11	7	2	5	5	4	21	7	31	11
Hydropsychidae												
<i>Cheumatopsyche cornix</i> MALICKY, 1997	1						1	3				1
<i>Diplectrona dulitensis</i> KIMMINIS, 1955	1	1				2		4	4			4
* <i>Hydromanicus malayanus</i> BANKS, 1931	1	1	1	4	1	1	2	2	3	2	2	1
<i>Macrosternum dohrni</i> ULMER, 1905									1			
<i>Macrosternum fenestratum</i> ALBARDA, 1887		8					30	12		2		
<i>Macrosternum indistinctum</i> BANKS, 1911							1					
Lepidostomatidae												
<i>Lepidostoma doligung</i> MALICKY, 1997							3	7	11	10	3	1
Leptoceridae												
<i>Adicella koronis</i> MALICKY & THANI, 2002						1			1			
** <i>Adicella elon</i> MALICKY & PROMMI, 2008												3
<i>Oecetisasmada</i> MALICKY, 1997						1		8	2			
<i>Oecetis hemerobiooides</i> McLACHLAN, 1866								2				

Species/date	2006								2007				
	27/ 06	6/ 07	6/ 08	12/ 09	1/ 10	1/ 11	14/ 12	3/ 01	10/ 02	26/ 03	22/ 04	5/ 05	9/ 06
** <i>Oecetis husam</i> MALICKY & PROMMI, 2008									2				
<i>Oecetis miletos</i> MALICKY & NAEWVONG, 2005											1		
<i>Oecetis pegasos</i> MALICKY & NANTAKWANG, 2005													
<i>Oecetis tripunctata</i> FABRICIUS, 1793									1		1		1
<i>Setodes sarapis</i> M & C, 1993								3	5		1	1	
<i>Tagalopsycye brunnea</i> ULMER, 1905											1		
<i>Triaenodes narkissos</i> MALICKY, 2005								1	1				
C a l a m o c e r a t i d a e													
<i>Anisocentropus diana</i> M & C, 1993	4	5		3	1	1	2	1	6	3	25		
<i>Anisocentropus brevipennis</i> ULMER, 1906	4	9	2	1	2	2		5	17	9	1	1	

Tab. 2: Abundance of caddisflies collected by black light traps operated at Ko Hong Hill nature preserve area.

Family	Number of individuals	% of total catch	Number of species	% of species
Rhyacophilidae	29	5.11	1	2.78
Hydroptilidae	2	0.36	2	5.56
Philopotamidae	56	9.88	6	16.67
Polycentropodidae	26	4.59	4	11.11
Psychomyiidae	18	3.17	1	2.78
Economidae	162	28.57	2	5.56
Hydropsychidae	98	17.28	6	16.67
Lepidostomatidae	35	6.17	1	2.78
Leptoceridae	37	6.53	11	30.56
Calamoceratidae	104	18.34	2	5.56

Tab. 3: Meteorological parameters in Ko Hong Hill nature preserve area.

Month	Air temperature (Celcius)	Water temperature (Celcius)	Relative Humidity (%)	Rainfall (mm.)	Wind (m/s)
Jun-06	29	29.2	76	71.6	0.5
Jul-06	29	29.1	76	53.4	0.8
Aug-06	29.3	29.5	74	87.4	0.9
Sep-06	28.3	28.4	78	301.4	0.4
Oct-06	28.4	28.3	79	146.9	0.6
Nov-06	28.1	26.8	81	155.5	0.9
Dec-06	27.9	26	81	261.7	1.6
Jan-07	27.5	26.4	80	217	2
Feb-07	27.9	27.4	75	9.1	1.6
Mar-07	29.2	28.4	72	91.8	1
Apr-07	29.6	28.5	75	67.4	0.9
May-07	29.5	28.4	75	257.1	0.5
Jun-07	29.4	29.1	75	118.8	0.3

Source: Haad Yai meteorological station.

Tab. 4: Pearson's correlations between meteorological parameters on abundance of adult Trichoptera.

Taxa	Air temperature (Celcius)	Water temperature (Celcius)	Relative Humidity (%)	Rainfall (mm.)	Wind (m/s)
<i>Rhyacophila tantichodoki</i>					0.647*
<i>Ecnomus taleban</i>	-0.572*	-0.739**			0.762**
<i>Ecnomus venimar</i>				-0.622*	
<i>Cheumatopsyche cornix</i>					0.561*
<i>Diplectrona dulitensis</i>					0.602*
<i>Macrostemum fenestratum</i>	-0.559*				0.730*
<i>Macrostemum indistinctum</i>					0.624*
<i>Lepidostoma doligung</i>					0.690**
<i>Oecetis asmada</i>	-0.620*				0.717**
<i>Oecetis hemerobiooides</i>					0.624*
<i>Setodes sarapis</i>		-0.689**			0.730**
<i>Triaenodes narkissos</i>	-0.625*	-0.757**	0.595*		0.751**
<i>Anisocentropus brevipennis</i>				-0.633*	